A Cognitive Analysis of the Perception of Shape and Motion Cooperation in Virtual Animations

Amel Achour Benallegue, Annie Luciani, Ali Allaoui, Saman Kalantari

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Amel Achour Benallegue* a.achour.benallegue@gmail.com
Annie Luciani* Annie.Luciani@imag.fr
Ali Allaoui*+ Ali.Allaoui@imag.fr
Saman Kalantari* Saman.Kalantari@imag.fr

*ICA Laboratory, Grenoble Institute of Technology, Grenoble, France
+Laboratoire XLIM, CNRS, Université de Poitiers, France

Abstract

In order to better understand perceptual and cognitive features of shapes and motions associations, we first create synthetic animation composed of realistic motions modeled by physical modeling mapped on abstract shapes. Second, we propose such paradoxical and surprising animations to subject's observations and we analyze them by qualitative analysis methods.

CR Categories: J.4 [Social and behavioral sciences]: Psychology; H.5.1 [Information interfaces]: Animation; J.5 [Arts and humanities]: Arts, fine and performing.

Keywords: Computer animation, cognitive psychology.

1 Overview of the method

Animations are the perceptual material in the psycho-cognitive experiments. The building process of these animations consists in designing first a physical model for the motion by using the MIMESIS software [Evrard et al. 2006] and then by coating the motion by arbitrary abstract shapes, such as lines, surfaces, elementary volumes, or more complex quite realistic shapes such as representations of garments with tearing. Each motion is coated by three types of shapes, defined by differences in their topology, their geometry or their visual rendering. The mapping of a same motion on different coatings produces perception ambiguities. To determine the impact of these ambiguities on human perception and on the creativity sense, we developed a set of psychological and cognitive experiments. In the context of human studies, the appropriate domain for the work presented here is related to qualitative research methods, based on semi-structured interviews and content analysis method [Flick 2002].
The experimental protocol is composed of 4 stages: 1) Presentation of built animations at each person. Figure 1 shows one of the five animations proposed, called "Blobby model". 2) Individuals watch three pairs of the designed videos, each pair containing the same motion. 3) Performing free interviews with individuals on their perception of animations. All the interviews are recorded on audiovisual support. 4) Focusing the discourses of the human subject onto a few major levels of the discourses: sensation, evocation, imagination and cognition.

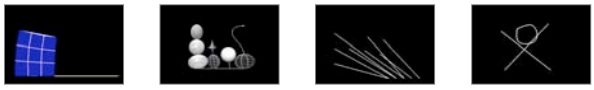

Figure 1: *The "blobby model" and its abstract visual coatings*

2 Experimental results

The experimentations analyses led us to two classes of observations: 1) those related to common subject's behaviors and 2) those related to the respective influences of both motions and shapes on the human perception.
The first main observation is that, despite our apprehension that participants would be annoyed when viewing these strange and often abstract videos, all participants were unanimously highly interested and stayed more than one hour in front of the videos for the experiment. The second main observation is that all participants considered animations as "intriguing". Participants set a hypothetic plausible scene and attempted to recognize it by several manners. This observation confirms results presented in [Luciani et al. 2007]. We can classify these interrogations into two main behaviors: (1) The reference to the real world by seeking real situations similar to the animation. (2) The exploration of pictures by abstract reasoning.
Behavior and reactions of subjects highlights two common stages of cognitive behavior: 1) the step of *finding*, where the subjects construct an idea of an inferred scene that possibly corresponds to the observed video. And 2) the step of *comparison with cognitive schemas*, where the person confronts the idea built during the stage of finding with personal knowledge schemas acquired in its past life. In the case of some compatibility, participants make assumptions and conclusions on the picture and its behavior. In the case of no compatibility, participants are faced to paradoxes and / or misunderstanding, that lead him/her to appreciate, to reject or question the seen scene, and to enter in what we called "*an exploratory process"*, that confirms the theory of enaction [Stewart et al. 2010].

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